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Understanding Millisieverts And Radiation Effects On Humans

By Ted Twietmeyer

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The main purpose of this article is to help define radiation damage to humans.

REMS CONVERSION TO SIEVERTS FOR OLDER GEIGER COUNTERS

(If you don't use an older geiger counter skip this paragraph.) In the USA, dose damage units was historically measured in rems. Many civil defense surplus geiger counters display radiation in rems. Conversion from millisieverts (.001 sieverts) to rems is accomplished simply by moving the decimal point.

For example, 1 millisievert = .1 rems and 2,000 millisieverts = 200 rems

SIEVERTS CONVERSION

100 counts/minute = 1 microsievert

1 sievert = 1,000 millisieverts

1 sievert = 1,000,000 microsieverts

RADIATION EFFECTS ON HUMANS

Biological damage for various radiation levels was determined about 50 years ago by the US government's Civil Defense Agency, now known as FEMA. I trust human radiation damage exposure levels listed in this older manual than those in the July 1990 FEMA manual which replaced it.

Following shows radiation effects on humans with increasing exposure. This was copied directly from an official manual printed by the US government

[3]. For simplicity radiation dose is shown below in millisieverts:

500 millisieverts:

No visible effects.

75 to 1,000 millisieverts:

Brief periods of nausea on the day of exposure in about 10% of the group.

2,000 millisieverts:

As many as 50% of the group may experience some of the symptoms of radiation sickness. Although only 5% to 10% may require medical attention, no deaths are expected.

4500 millisieverts:

Serious radiation sickness in most members of the group followed by death to about 50% in two to four weeks.

6,000 millisieverts:

Serious radiation sickness in all members of the group followed by death of almost all members within one to three weeks.

*** end of quote ***

1,000 millisieverts/hour is a recent radiation measurement reported outside reactor #3. [1]

You probably don't want to know how the US government obtained the above exposure damage data. Even at 500 millisieverts it's not known if damage to DNA is taking place. Most experts today state that any elevated radiation level is bad for you and increases the risk of cancer proportionately.

A "group" refers to a group of survivors inside a fallout shelter after a nuclear attack. But it doesn't matter how big any group of people is. For example, if 10,000 people are exposed to 2,000 millisieverts, then about 5,000 people will experience radiation sickness.

Other people in Japan can still suffer DNA damage, even if living some distance away in Tokyo. Recent elevated levels in Tokyo sewer sludge show that when it rained people were probably pelted with radioactive fallout. Or worse - the public water supply or food is contaminated. With the Japanese culture and government's policy of not saying anything bad to upset people, we'll probably never know the full extent of human exposure and total number of deaths.

Nuclear plant workers have been tested with full body scanners. 1,193 had radiation counts of more than 10,000 counts/minute (100 microsieverts.) [2] Each "count" is one high speed particle forcing it's way through live human

cells to escape the body and reach the scanner. Each one of these particles is can alter cell DNA and increase the potential for cancers. Once radioactive materials are present inside the body's tissues complete removal is difficult.

It's difficult to comprehend the scope of trying to decontaminate a huge, crowded city the size of Tokyo and the hundreds of square miles surrounding it. This has never been attempted before in human history. And where would the enormous volume of waste be stored?

ALPHA PARTICLES

Rarely discussed in the media is ionizing radiation damage caused by low energy alpha particles. These particles are NOT detected by ordinary geiger counters. A special alpha particle detector is required to detect alpha particles; these particles are stopped by a sheet of paper. Geiger counter tubes are usually made of metal which alpha particles cannot penetrate.

Dusty materials emitting alpha particles are caught by lung tissue when inhaled. After embedding in the lungs, dust particles continue to give off alpha radiation for many years causing on-going damage and mutating DNA, ultimately causing lung cancer. It's worth noting however, that when alpha particles are present beta and gamma are usually also present, which are readily detectable by a geiger counter.

People in high risk areas who won't buy a geiger counter simply because it cannot detect alpha particles, are making a big mistake.

TOXICITY

Heavy metal toxicity effects are outside the scope of this article, but these metals present another health hazard wherever radioactive materials are present. Plutonium is among the worst of these - one tiny particle can kill a human being.

Hopefully this article will help people who use geiger counters and those who want to understand radiation measurements in articles. Clearly a serious problem exists in Japan. With radiation spreading even further out into the world it's wise to be aware and prepared.

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[1] <http://ex-skf.blogspot.com/2011/05/1000-millisievertshr-debris-outside.html>

[2] <http://mdn.mainichi.jp/mdnnews/news/20110521p2a00m0na021000c.html>

[3] Handbook for Radiological Monitors dated April 1963, page 29.

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